REMARKS

Claims 1-5, 8-10 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by US patent 4,701,714 (AGOSTON). In response claims 1-5, 9, and 10 are amended. Claim 8 is rewritten in independent form including all of the limitations of its parent claims. The Examiner is respectfully requested to withdraw the rejection of claim 8 in view of the remarks below distinguish claim 8 over AGOSTON.

Claim 6 is rejected under 35 USC 103(a) as being unpatentable over AGOSTON in view of US patent 4,829,272 (KAMEYA) and in response claim 6 and its parent claim 1 are amended.

Claims 11-13 are rejected under 35 USC 103(a) as being unpatentable over AGOSTON in view of US patent 4,701,714 (KONDO). In response claims 11 and 12 are amended.

Claims 17 and 18 are rejected under 35 USC 103(a) as being unpatentable over AGOSTON in view of US patent 5,640,042 (KOSCICA) and in response the patent claim 12 of claims 17 and 18 is amended.

Claims 7, 14, 15, 19, 20 and 21-27 are objected to as being dependent of a rejected base claims. In response to this objection claims 7, 14, 19, 21 and 25 are rewritten in independent form to include all of the limitations of their parent claims. Claim 15 is also rewritten in independent form, but, see the remarks below relative to claim 15.

The following remarks distinguish each of the applicants claims as amended over the cited prior art.

Claim 1

Claim 1 recites a transmission line having an adjustable path delay. It is known that the path delay of a transmission line is a function of its inductance and capacitance and that it is possible to adjust its delay by adjusting its capacitance. AGOSTON's variable delay transmission line employs several varactor diodes D1-DN connected to a signal conductor 12/14 through a set of discrete coupling capacitors C1-CN. The signal path delay through the transmission line can be adjusted by adjusting an output voltage Vt of a voltage source connected to each varactor diode for controlling the varactor diode's capacitance. AGOSTON couples many small varactor diodes to the signal path though many discrete capacitors in order to distribute the effects of the varactor capacitance and the coupling capacitance on the characteristic impedance of the transmission line. While delay control could be

provided by a single large varactor diode directly coupled to the transmission line or coupled through a single large discrete capacitor, AGOSTON wanted to avoid any large discontinuity in transmission line characteristic impedance at the single point of contact of a large varactor diode and capacitor because such discontinuity in character impedance can substantially distort the signal being conveyed on the transmission line. But one drawback to AGOSTON's system is that it requires many discrete capacitors and varactors. The applicant's invention solves the problem of distributing variable capacitance without having to provide large numbers of varactor diodes or any discrete capacitors.

Referring, for example, to the applicant's FIGs 15-17, the applicant's transmission line (as recited in claim 1) comprises a signal conductor 74 and a coupling conductor 75 proximate to and coextensive with at least a portion of the signal conductor. One (or two as in FIG. 17) varactor diodes are connected between coupling conductor 75 and ground and a voltage source (DAC 88) supplies a control voltage to coupling conductor 75 for controlling the capacitance of varactor diode D1. Note that the <u>inherent</u> capacitance C between coupling conductor 75 and signal conductor 74 is distributed over the transmission line and that coupling conductor 75 tends to also distribute the capacitance of varactor diode(s) D1 over path 74. The applicant's transmission line as recited in claim 1 thus achieves substantially the same result as AGOSTON's transmission line with respect to controlling path delay and with respect to limiting signal distortion but without requiring any discrete capacitors or a large number of distributed varactor diodes.

Claim 1, as amended, is patentable over AGOSTON because AGOSTON does not teach using a "coupling conductor" to provide the coupling capacitance as recited in claim 1, as amended.

The Examiner cites KONDO as disclosing first and second control lines 4 and 4' (FIG. 8) connected to varactor diodes and suggests that control lines 4 and 4' are similar to the applicant's "coupling conductor". However claim 1 recites that the coupling conductors are "positioned sufficiently near a portion of the signal conductor that an inherent first capacitance between the signal conductor and the first coupling conductor is sufficiently large to couple the first variable capacitance of the first varactor diode to the signal conductor and enable the variable capacitance to substantially influence a rate at which the signal conductor conveys

the signal between the two points". KONDO does not teach that lines 4/4' are proximate to the signal path or that an inherent capacitance between signal the path and control lines 4/4' couples a varactor diode to the signal path. The varactor diodes are directly connected to the signal path.

Thus claim 1 is patentable over AGOSTON alone and over the combination of AGOSTON and KONDO.

Claims 2 and 3

Claim 2 depends on claim 1 and is patentable over the combination of AGOSTON and KONDO for similar reasons.

Claim 2 is amended to recite that the signal path is embedded in an insulating substrate and claim 3 is amended to recite that the coupling conductor is also embedded in the insulating substrate. The Examiner indicates that AGOSTON (column 4, line 44) teaches that the signal conductor is embedded in a substrate, but AGOSTON column 4, line 44 does not mention anything about a signal conductor being embedded in a substrate. The Examiner may have intended to refer to AGOSTON's column 2, lines 43-47, but this section of AGOSTON indicates that the delay line should be formed <u>on</u> (not embedded <u>in</u>) an insulating substrate. Thus AGOSTON teaches away from embedding the signal conductor. Moreover since the same section of AGOSTON teaches that the capacitors to be connected to the signal path at various points along its path are "hybrid chips" it would not be obvious to one of skill in the art to embed AGOSTON's signal conductor as it would be difficult to connect a large number of hybrid chip capacitors to a signal path that is buried inside an insulating substrate. One major advantage to the applicant's use of a coupling conductor rather than a set of discrete capacitors to provide the coupling capacitance between the signal path and the variable capacitance is that since coupling conductor is not directly connected to the signal path, the signal path <u>can</u> be conveniently be embedded in a substrate. This gives a circuit board designer much more freedom in laying out a variable delay transmission line because the conductors can be embedded and need not be occupy scarce real estate on the circuit board's surface as taught by AGOSTON.

Claims 4-6

Claims 4-6 depend on claim 1 and are patentable over the cited references for similar reasons. Relative to claim 6, the

Examiner cites KONDO as disclosing a DAC supplying a voltage controlling a variable capacitance diode, but like AGOSTON, KONDO fails to disclose the first coupling conductor of parent claim 1.

Claim 7

Claim 7 is rewritten in independent form in response to the Examiner's objection.

Claim 8

Claim 8 is rewritten in independent form and amended to positively recite the insulating substrate as being a part of the transmission line. Claim 8 is patentable over the cited references for reasons similar to those discussed above in connection with claim 2 insofar as it recites that the signal path is embedded in the insulating substrate.

Claim 9

Claim 9 depends on claim 1 and is patentable over the cited references for similar reasons. Claim 9 further recites (as illustrated for example, in the applicant's FIGS. 15-17) a "second coupling conductor" 76 and a "second varactor" diode D2. AGOSTON's transmission line is subject to signal distortion arising from variations in varactor capacitance caused by the normal variations in the amplitude of the signal being conveyed by the signal conductor. The recited second varactor and second coupling conductor of claim 9 compensate for such variations in path delay so as to avoid that type of signal distortion. AGOSTON teaches more than one varactor diode but does not teach the recited "second coupling conductor".

Claim 10

Claim 10 depends on claim 9 and is patentable over the cited references for similar reasons. Claim 10 also recites that "an anode of the first varactor diode is connected to the first coupling conductor and a cathode of the second coupling conductor is connected to the second coupling conductor". AGOSTON teaches more than one varactor diode, but they are not connected to coupling conductors with differing polarities.

Claims 11-13

Claims 11-13 depend on claim 9 and are patentable over the cited references for similar reasons.

Claims 14

Claim 14 is rewritten in independent form in response to the Examiner's objection to claim 14.

Claim 15

The Examiner has objected to claim 15 as relying on a rejected parent claim. Since the original claim 15 recited "the first coupling conductor" and "the second coupling conductor" for which there was no antecedent basis, claim 15, now rewritten in independent form, has been modified to correct the antecedent basis problem.

Claim 16

Claim 16 depends on claim 9 and is patentable over the cited references for reasons discussed above in connection with claim 9 and also for reasons discussed above in connection with claim 2.

Claim 17

Claim 17 depends on claim 1 and is patentable over the cited references for reasons discussed above in connection with claim 1. Claim 17 also recites that the first varactor diode is a "first thin film varactor diode". The Examiner correctly cites KOSCICA as describing a thin film varactor. The Examiner suggests that it would be obvious to replace the AGOSTON's multiple varactor diodes with KOSCICA's thin film varactor, though neither AGOSTON nor KOSCICA make such a suggestion. In any case, replacing any of AGOSTON's varactor diodes with a thin-film varactor would not render AGOSTON's transmission line equivalent to the transmission line of claim 17 as it would lack the recited "first coupling conductor" which neither AGOSTON nor KOSCICA teach.

Claim 18

Claim 18 depends on claim 9 and is patentable over the cited references for reasons discussed above in connection with claim 9 and also for reasons discussed above in connection with claim 17.

Claim 19

Claim 19 is rewritten in independent form in response to the Examiner's objection to claim 19.

Claim 20

Claim 20 depends on claim 9 and is patentable over the cited references for reasons discussed above in connection with claim 9 and also because the cited reference fail to disclose coupling conductors comprising conductive fingers positioned near the signal conductor.

Claims 21-24

Claim 21 is rewritten in independent form in response to the Examiner's objection to claims 21-24.

Claims 25-30

Claim 25 is rewritten in independent form in response to the Examiner's objection to claims 25-30.

Claims 31-37

Claim 9 is amended in response to the Examiner objection to claims 31-37.

It is believed that in view of the foregoing amendments and remarks, the application is in condition for allowance. Notice of Allowance is therefore respectfully requested.

Respectfully submitted,

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